RR RF Issues Revisited

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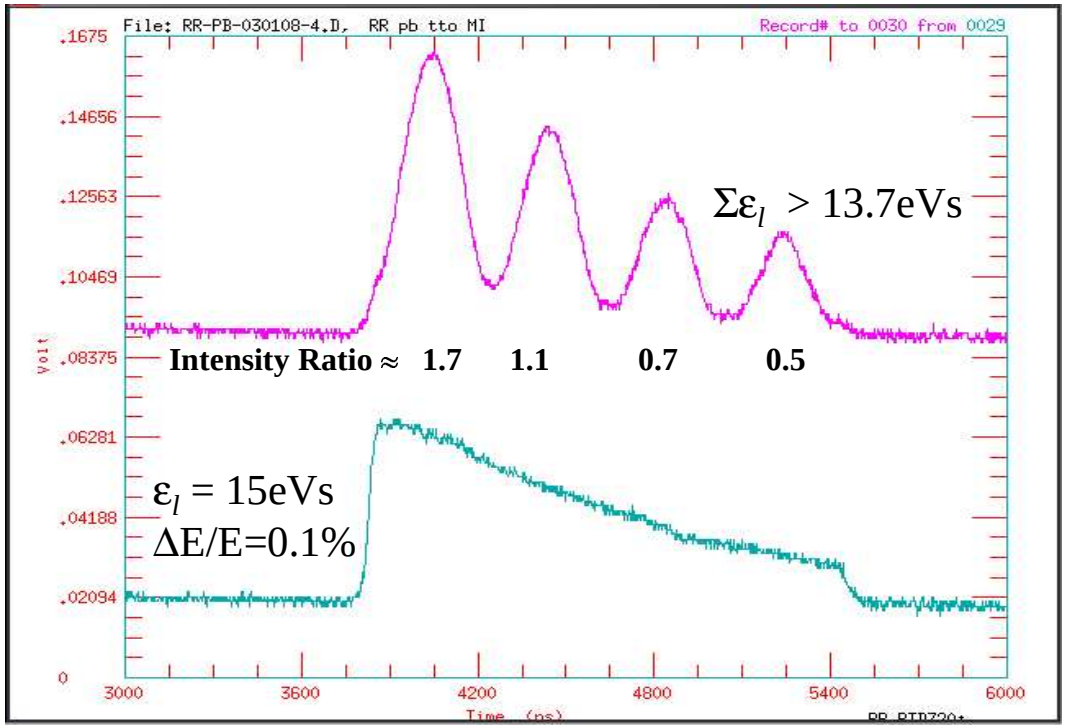
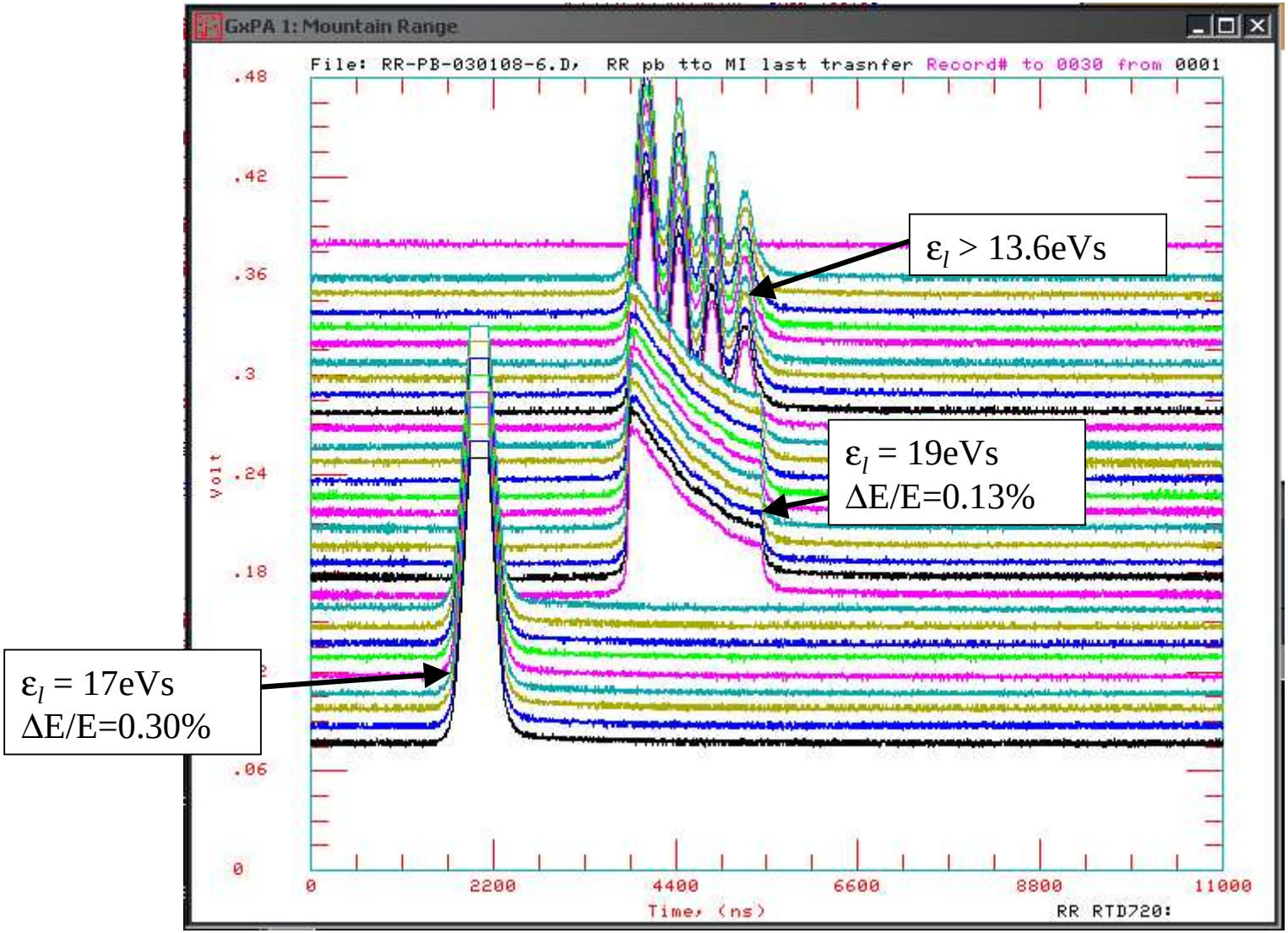


- Proton and Pbar Data
- ESME Simulations
- How will we proceed?

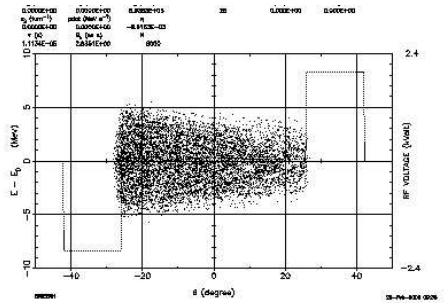
Pbar Un-stacking (RR→MI Transfer 6, January 8, 2003)

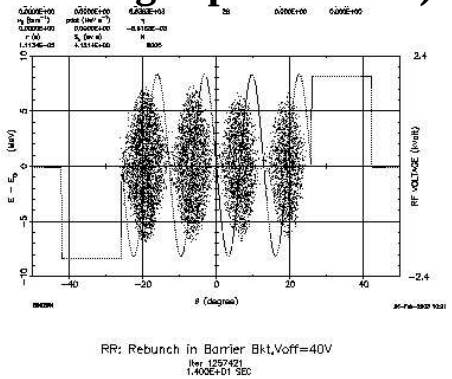


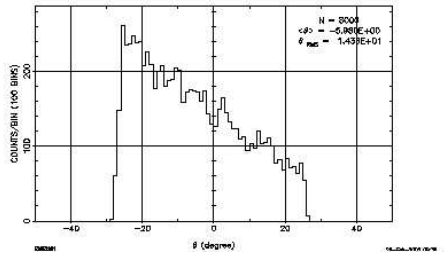
ESME Simulations

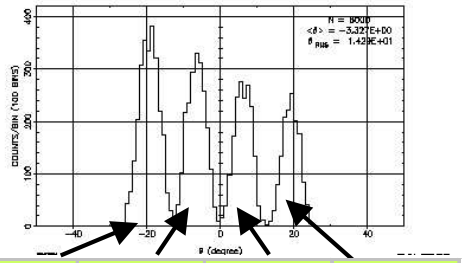
ε_l(initial) = 3.4eVs /2.5MHz bunch

Voffset = 40V (i.e., 1% of 2kV which is design specification)









1.36	1.21	1.07	0.95	ε_l(final)/ε_l(init)
1.31	1.07	0.89	0.72	Intensity Ratios

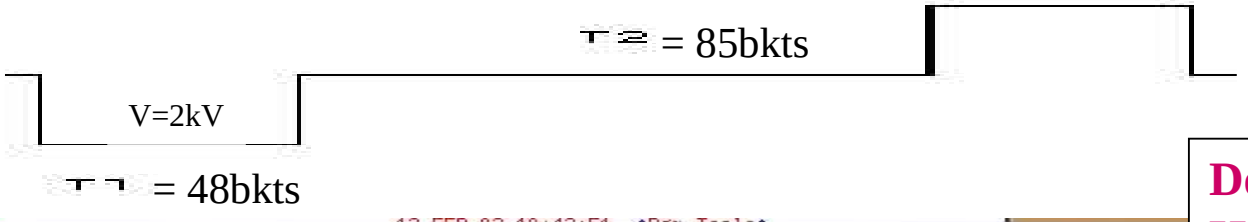
14 sec after de-bunching in RR

3 sec after re-bunching in RR

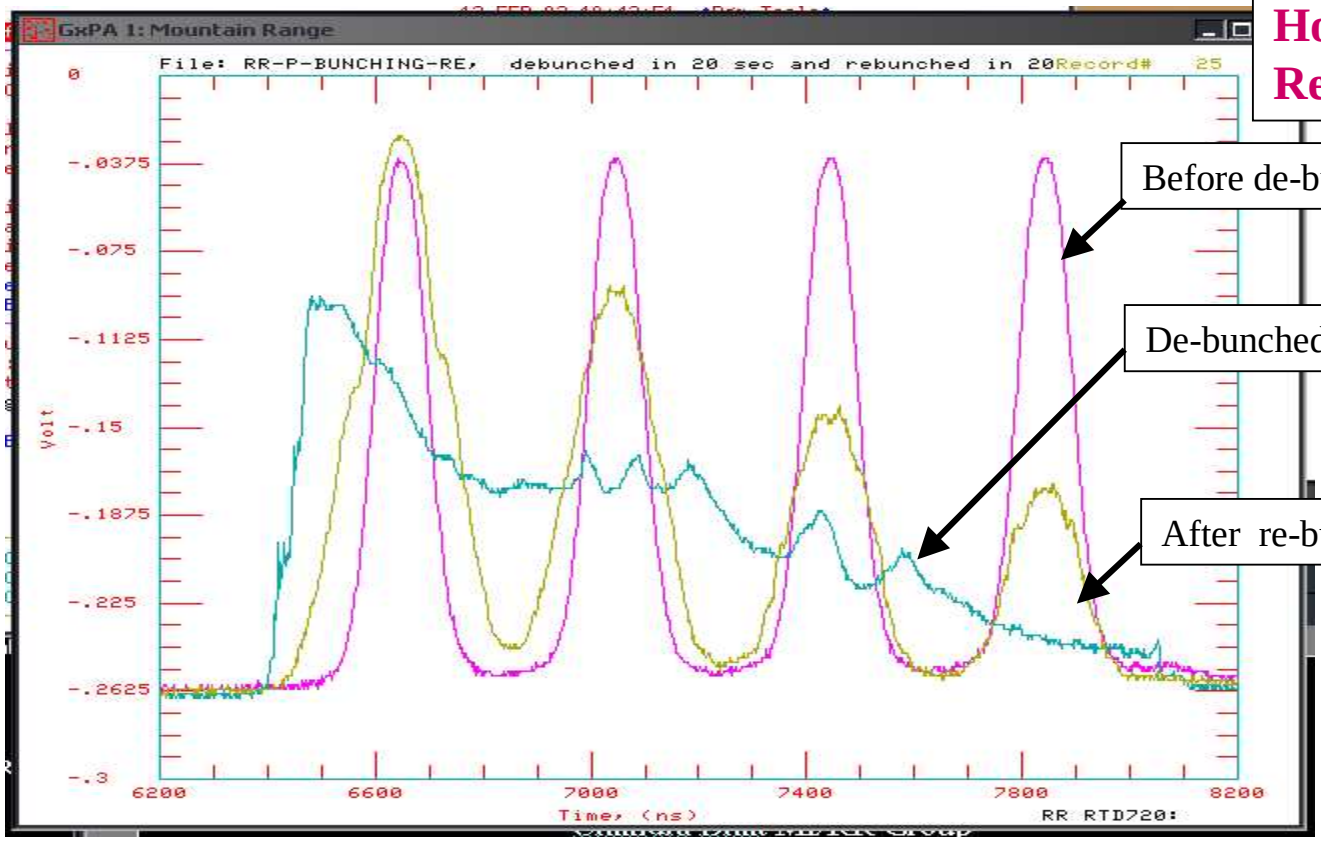
Similar distributions can be generated by putting

- an off-set of >30% to –ve pulse of the barrier bucket,
- a slant to the rf wave between barrier pulses

De-bunching and Re-bunching in 2.5 MHz rf buckets



De-bunching time = 20 sec
Hold off time = 8 sec
Re-bunching time = 20 sec



Before de-bunching

De-bunched

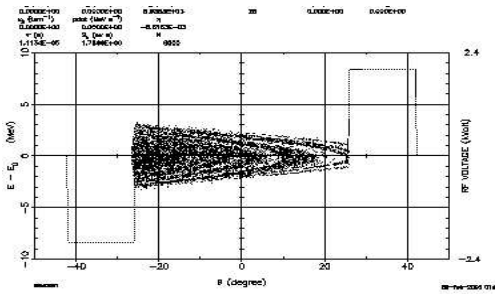
After re-bunching

Intensity Ratio ≈	**1.7**	**1.2**	**0.7**	**0.4**

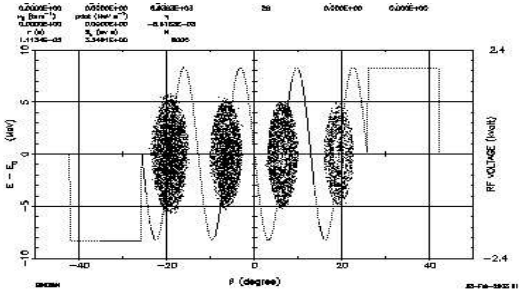
ESME Simulations

ε_l(initial) = 1.5eVs /2.5MHz bunch

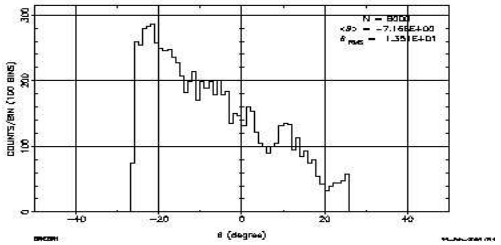
Voffset = 20V (i.e., 1% of 2kV which is design specification)



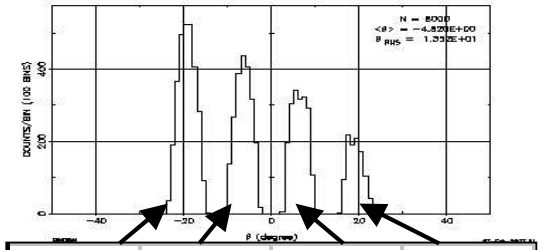
RR: Beam in Barrier Bkt, Voff=20V



RR: Rebunch in Barrier Bkt,Voff=20V



14 sec after de-bunching in RR



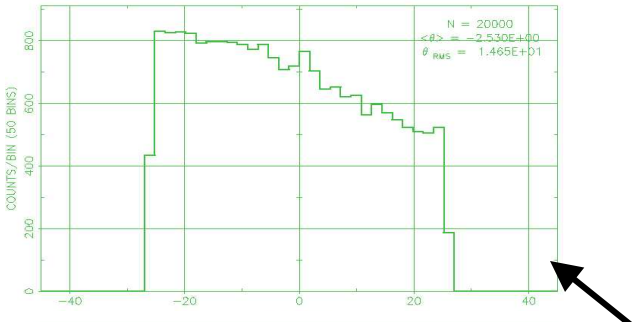
1.58	1.43	1.46	1.28
1.46	1.08	0.94	0.51

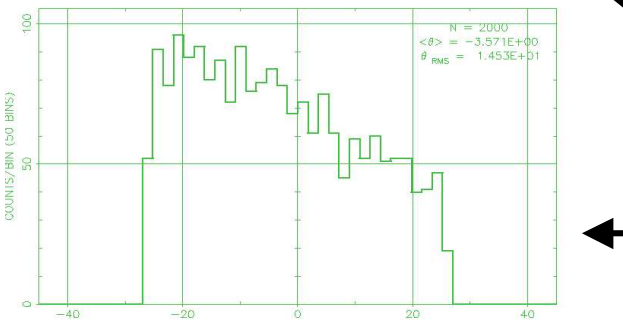
ε_l(final)/ε_l(init) Intensity Ratios

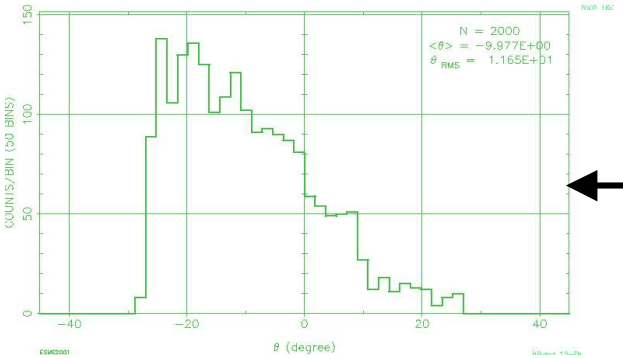
3 sec after re-bunching in RR

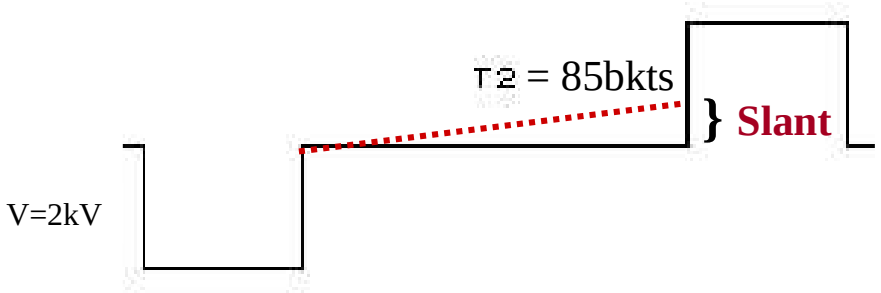
ESME with different Slopes

Particle Distributions after about debunching







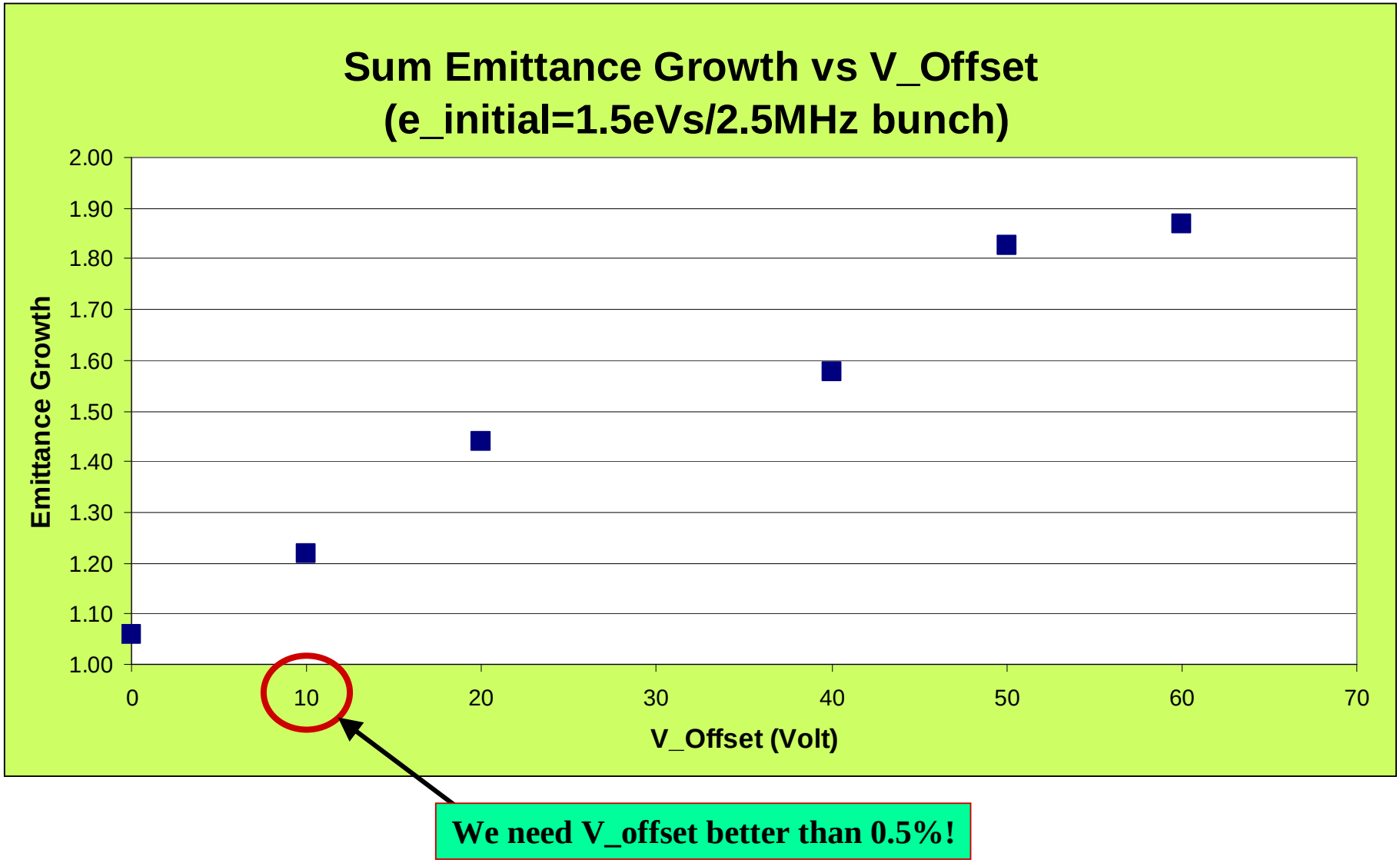


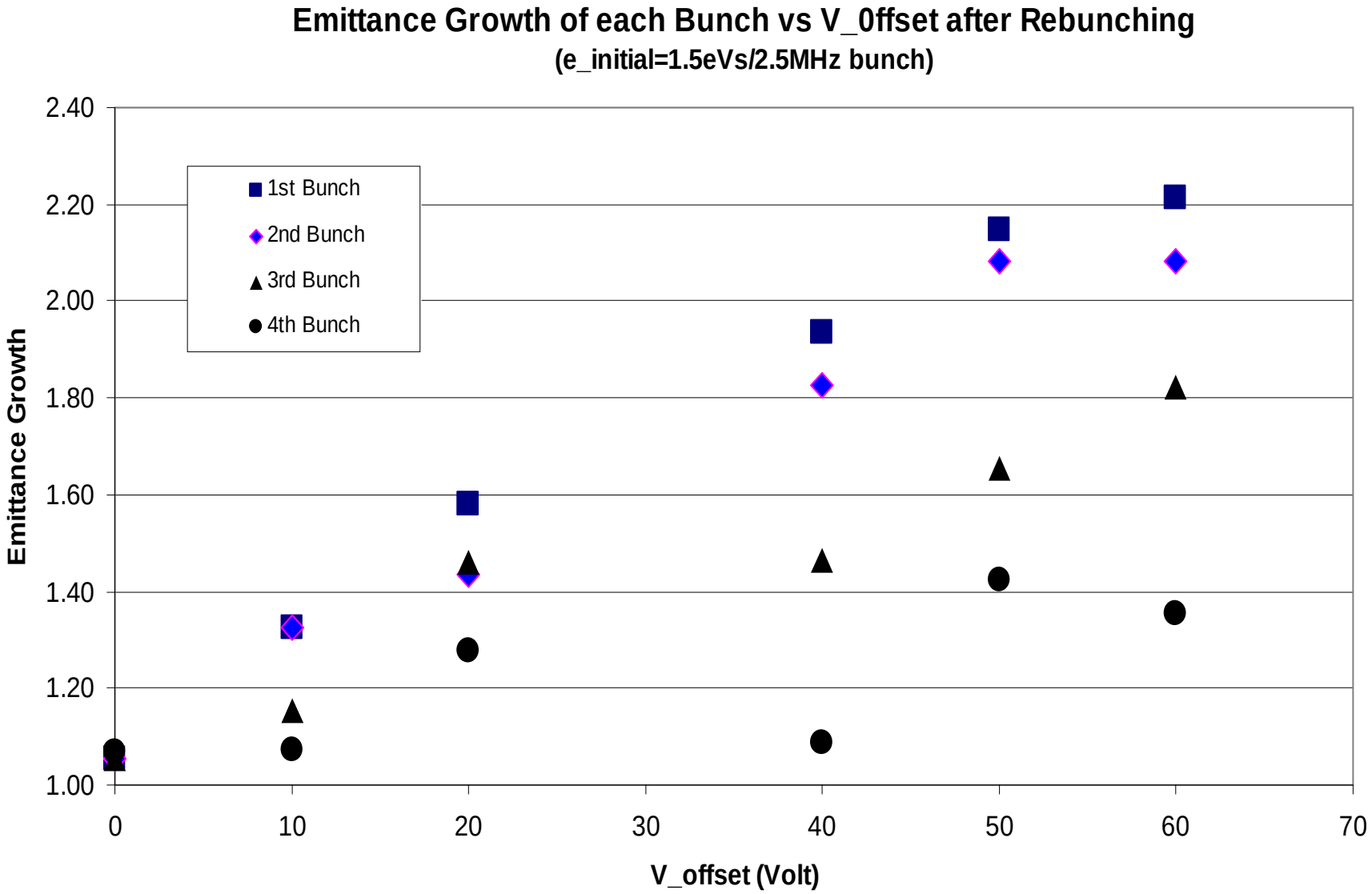
1% slant (i.e., 20V)

2% slant (i.e., 40V)

6% slant (i.e., 120V);
Should be able to see by bare eye on TV monitor Fan-out signals.

Injected beam in 2.5MHz buckets are de-bunched in 3 sec and kept for 8 sec and, re-bunched in 3 sec
The emittance growths simulated using ESME for different V_offset are shown below.




Emittance Growth of each Bunch vs V_0ffset after Rebunching
(e_initial=1.5eVs/2.5MHz bunch)
Emittance Growth
2.40
2.20
2.00
1.80
1.60
1.40
1.20
1.00
0
10
20
30
40
50
60
70
V_offset (Volt)
1st Bunch
2nd Bunch
3rd Bunch
4th Bunch

Comments and some Issues

- The proton and pbar data and ESME simulations for re-bunching the beam in the barrier bucket in RR indicate substantial longitudinal emittance growth. We relate this problem to
  - V_offset ≠ 0V
  - Slant in the rf wave form between barrier
  - Or both of the above
- To achieve emittance growth <10% we need total V_offset <0.5% (which is <10V in the baseline)
- After meeting above requirements we may have to fine tune the wave forms.